

2007 University of the Virgin Islands Research Annual Report

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2007 University of the Virgin Islands Research Annual Report

I. Report Overview

1. Executive Summary

The work conducted by AES scientists is production oriented. The small size of AES and limited physical and fiscal resources limit our ability to expand into new research areas. One area that we acknowledge being insufficient in is economic analysis of our research results which would aid scientists in determining the impact of their work. All research faculty are encouraged to include an economic analysis, where appropriate, in their projects to help determine the potential benefits the work would have for local producers. In some cases this is not possible due to the nature of the project or the area of research. In other cases it is due to a lack of expertise in this area within AES. The second issue has been addressed by developing collaborations with outside resources (VI Dept of Agriculture, UVI Small Business Development Center, professionals at other institutions) for economic and marketing analysis.

The AES Animal Science Program is continuing to participate in several multistate research projects on sheep and cattle. The Senepol cattle herd is being managed more efficiently to make the operation more suitable for conducting research. As a direct result of the acquisition of the cattle herd in 2006 Dr. Godfrey was invited by the Panama Senepol Association to be an invited speaker at the Research Symposium they hosted in 2007. The symposium was attended by 75 cattle producers and researchers from the US and Central and South America. As part of the CariPac Consortium and with grant funds from the program for Resident Instruction in the Insular Areas, a student conducted a research project during the summer 2007. The student used thermal imaging to determine if the time of lambing could be predicted. Her results showed that it was not possible to predict the time of lambing using this method. She presented her results at the Student Research Symposium on the St. Thomas campus in the Fall of 2007. The VI Department of Agriculture offered a Small Livestock Workshop and Dr. Godfrey was the presenter at the workshop. It was attended by 15 farmers, some of whom were also members of the VI Farmers Cooperative.

The Animal Science Program is still experiencing difficulty with a staff vacancy within the program. A suitable candidate was identified and had accepted the job offer but at the last minute (2 days before coming to St. Croix) turned it down. The position has been advertised again as a Research Analyst (B.S. level) instead of a Research Specialist (M.S. level) in hopes of getting a broader array of applicants. The hair sheep research program is progressing and dealing with developing issues that are important to the producers, such as the use of crossbred animals for the production of meat and how well these animals survive in our environment.

The AES Aquaculture Program held its Ninth Annual Aquaponics and Tilapia Aquaculture Short Course on June 17 through 23, 2007. This year's class set an attendance record with 63 students, who came from two U.S. territories (U.S. Virgin Islands and Puerto Rico), 17 U.S. states (Arkansas, Arizona, Colorado, Florida, Georgia, Hawaii, Louisiana, Maryland, North Carolina, New Jersey, New York, Ohio, Oklahoma, South Carolina, Texas, Virginia, and Washington) and 16 other countries (Australia, Barbados, Belize, Canada, Colombia, Costa Rica, Ethiopia, France [Martinique], Hong Kong [China], Jamaica, Mexico, Netherlands Antilles [Curacao], Nigeria, Trinidad, U.K. [Scotland], Venezuela). In this year's class all seven continents were represented as one participant works at the McMurdo and Amundsen-Scott Research Stations in Antarctica where he grows fresh hydroponic vegetables for the staff. With this year class the total number of students trained by the program comes to 271 individuals from four U.S. territories, 35 states and 35 countries. The training program has led directly to the establishment of aquaponic research programs with systems based on the University of the Virgin Islands (UVI) design at the University of Guam, Northern Marianas College (Saipan), King Abdul Aziz University (Riyadh, Saudi Arabia), Rutgers University EcoComplex (Bordentown, New Jersey), Crop Diversification Center South (Brooks, Alberta), and Lethbridge Community College (Lethbridge, Alberta). In addition, educational/demonstration systems have been established in Albion, New York, Dade City, Florida and Martinique. A demonstration system will soon be constructed in St. Maarten for Small Enterprise Stimulus Netherlands Antilles. Epcot Center will soon display an aquaponics system that includes some UVI design features. The training program has led directly to the establishment of commercial operations based on the UVI design in Orlando (two operations), Flanagan, Illinois, Kansas City, Hawaii (big island), Antigua, Guadalajara, Mexico, and North Queensland, Australia. Two students from the Math and Science Division were mentored by the Aquaculture Program as part of the Research Initiative for Scientific Enhancement (RISE) Program.

This year marked the 7th year that the Aquaculture Program Leader has written a Question and Answer Column for Aquaponics Journal, a quarterly trade publication with 1,500 subscribers. The advice given is very detailed and most likely has helped the questioners and other interested readers improve their aquaponic systems. As a result of increased demand for small-scale aquaponic systems, the consulting arm of Aquaponics Journal fabricates and sells aquaponic systems based on the UVI design. The Aquaculture Program Leader was invited to be a guest speaker at the national aquaculture conferences in Canada and Columbia where he gave a total of five presentations.

The Research Faculty/Program Leader of the AES Biotechnology & Agroforestry Program spent a six month sabbatical leave at Wageningen University in The Netherlands. The research focused on the induction of friable embryogenic callus from commercially important cassava varieties used in starch industry. Successful results were obtained from three of the six commercial varieties evaluated. The friable embryogenic cassava callus was used for genetic engineering to develop either amylose free starch or high amylose starch lines. The modified starch cassava has potential to be a value added crop for the tropical regions and the Caribbean. A staggered double row system for papaya production was developed which reduces the irrigation required, by concentrating the root area, while still producing yield equal to a single row system. A papaya production workshops was presented to farmers which included a field demonstration for farmers to see the growing system and also the varieties we make available via seed to the public. Bt sweet corn was grown and compared to the local open pollinated corn strains used for roasting. The Virgin Islands are plagued year round with corn earworms that cause substantial damage even with repeated spraying for worm control. The Bt sweet corn was 95% earworm free and the worms that did occur were smaller causing minimal damage to the ear. Sorrel, a fall and winter crop popular in the Caribbean was grown to evaluated the USDA sorrel germplasm collection and compare it to the local varieties grown. The Virgin Islands sorrel had greater tolerance to the high pH calcareous soils then those found in the USDA collection. Five university students participated in the research projects and were able to present their results at national conferences.

The AES Horticulture Program conducted research to support the horticultural vegetable industry composed of small acreage farms of less then five acres. In field row covers using antiviral screen were effective in controlling viral diseases in peppers. Pepper production using the row cover was twice that of open rows. Two undergraduate students assisted the horticultural program with the pepper study. Workshops were conducted through collaboration with CES on vegetable production to farmers. In addition, the horticulture program participated in the Mango Melee festival, VI Agriculture and Food Fair and the World Food Day with displays and assistance for tropical fruit tree production and micro-irrigation systems.

The AES Forage Agronomy Program in collaboration with the University of Florida has completed one year of research on the USDA-CSREES Integrated Organic Program research grant entitled "Crop Diversification Complexity and Pest and Beneficial Organism Communities in Humid Tropical and Sub-Tropical Climatic Regimes". This research initiative is a complex multi-system project that examines the effects of legume and grass cover crops, legume and grass cover crop combinations, and crop rotations on insect, weed, nematode, and pathogen communities in tropical organic crop production systems. This project has served as a model for organic crop production, agroecological principles, and sustainable agriculture practices for the U.S. Virgin Islands and the greater Caribbean region. This project has been the focal point to various tours, community functions, and public outreach that has spanned a broad audience that includes school groups, civic organizations, local farmer outreach programming, agriculture researchers and educators, and national agricultural political leaders. This project is the first of its kind in the Caribbean and takes place in conjunction with the Virgin Islands Sustainable Farm Institute which is the first USDA-NOP certified organic farm in the territory.

In addition, the collaborative SARE grant "Sustainable and profitable control of invasive species by small ruminants" is providing valuable information for the control of invasive plant species utilizing small ruminants as a biological control agent. This year plant samples and data from the on-farm and on-station studies feeding corral vine (*Antigonon leptopus*, an invasive ornamental prevalent on most Caribbean islands) to St. Croix hair sheep were analyzed in the lab and statistically, respectively. These results have been disseminated to producers. A follow-up study replacing 0, 25 and 50% of the diet with the woody legume tantan (*Leucaena leucocephala*, another invasive prevalent throughout the islands, very high in protein but also containing toxic mimosine) has been planned for 2008.

The last major Agronomy research initiative that took place during 2007 was the final year of data collection for the TSTAR grant entitled "Evaluation of Alternative and Conventional Small Ruminant finishing systems for the tropics". This year, the pasture finishing trials were accomplished by establishing 3 improved pastures (IP) and 3 native pastures (NP). The IP consisted of three tropical legumes (*Clitoria ternatea*, *Desmanthus vergatus*, *Lablab purpureus*, and *Vigna unguiculata*) that were direct seeded along with volunteer guinea grass (*Panicum maximum*). At the end of the establishment period pastures were stocked with Dorper X St. Croix White mixed sex pre-conditioned lambs. Both the IP and the NP received supplementation with crushed yellow feed corn (*Zea mays*) kernels at a rate of 1% BW. During the finishing trial IP lambs had 33% greater total weight gain than NP lambs. In addition, IP lambs had a 50% higher rate of gain than NP lambs. This project has real potential to improve livestock production operations in the tropics by providing economical methods to increase carcass quality and add carcass value to livestock in existing grassland production systems.

Total Actual Amount of professional FTEs/SYs for this State

Year:2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	15.5	0.0
Actual	0.0	0.0	16.0	0.0

II. Merit Review Process**1. The Merit Review Process that was Employed for this year**

- Combined External and Internal University External Non-University Panel

2. Brief Explanation

There has been no change made to the process as described in the initial Plan of Work submitted. A scientific peer review process is followed. Scientists submit three copies of their proposals to the Director, who attaches evaluation forms and sends them to three people who are qualified to judge the proposal. At least one of the reviewers is selected from CES. The reviewers are asked to rate the proposals on a scale of 1 to 5, 5 being the highest score, as to relevance and merit of the proposed project to the agricultural sector (justification). The evaluated proposals are then returned to the Director who gives the reviews to the scientist for any needed revisions. The revised proposal is then returned to the Director who verifies the improvements in writing and gives final approval. Scientists are required to publish their results but sometimes the project is completed before the PI has time to publish the results in a peer reviewed journal, so there is a lag between the project and publications. Because of the small staff size and amount of non-research related work each faculty an staff end up doing, finding time for writing is difficult for some faculty but we are looking at methods to remedy this, such as collaborating with other institutions to train graduate students and put more emphasis on outputs such as publication in the Faculty Annual Evaluation process.

III. Stakeholder Input**1. Actions taken to seek stakeholder input that encouraged their participation**

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Other (Informal contacts with local producers or co-ops)

Brief Explanation

The AES Advisory Council met to discuss issues of concern to the agriculture community and AES scientists continued to work in close contact with farmers as part of several research projects. The Advisory Council is composed of individuals involved in several aspects of agriculture (horticulture, livestock, and farmer's co-ops) from both St. Croix and St. Thomas. Members serve for 2 years and new members are recruited by the AES Director based on suggestions of the research faculty and existing members of the council. Research faculty present information on current projects and members of the Advisory Council express their concerns and opinions about what they see as the needs of the agriculture community. Issues are prioritized within discipline based on the input of the Advisory Council members in their role as representatives of the agriculture community. Some of the high priority issues that came up were assistance with marketing programs and educational programs for farmers. The VI Department of Agriculture has a marketing program that is supposed to be assisting farmers and this was mentioned to the Advisory Council. Local farmers groups are trying to work with the VI Dept. of Agriculture to keep this program going. The council was told that the Cooperative Extension service has offered short courses in both plant and animal production to local farmers, with the assistance of AES faculty. Other specific issues within a field of study brought up by the Advisory Council were discussed with the appropriate research faculty. Research faculty use the feedback from the council when developing future grants and research projects. Priority is given to those ideas that are researchable within the capabilities of the research programs at AES and funding sources. Because of the small staff size and limited scope of our programs not all areas can be addressed. In cases where the topic is outside of the AES faculty area of expertise efforts are made to get information for the stakeholders from other sources and put the stakeholders in contact with other people, either within UVI or outside, who can provide assistance. The small community and high level of contact with farmers help to provide continuous input and feedback from the community regarding the work being done by AES as well as providing a means for identifying the concerns of the agricultural community. The demographics of the USVI are such that all of our stakeholders would qualify as under-served or under-represented populations based on factors such as race, gender, economic status and farm size.

Workshops and seminars on various topics (horticulture, animal science, aquaculture and agronomy) were conducted and feedback was received from individuals, cooperatives and agribusinesses. Question and answer sessions at each event are used to allow the community to bring up issues that they feel are important to the agriculture community and this allows the AES scientists to get input on their research as well. Because of the small size of the agriculture community in the USVI, anyone who contacts AES regarding information on agriculture is considered a stakeholder. In most cases, input from stakeholders is directed at a specific program and the program leader is charged with deciding how to consider the input and what action to take. The response may be just a simple matter of providing information to the stakeholder in the form of verbal communication or technical bulletins. In other instances it may involve a visit to the farm to provide technical assistance with a crop (plant or livestock) in conjunction with the appropriate CES personnel.

The newly formed Virgin Islands Farmers Cooperative is taking a different approach to promoting agriculture in the USVI. They are developing plans for small scale crop production and are working with the Horticulture program on this. They are also working with the Agronomy and Animal Science Programs to develop hay production for small livestock production using some of the new, higher quality forages being evaluated.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Other (Informal contacts with individual producers)

Brief Explanation

AES is available to any individual or group who approaches AES with a question or a proposed research idea. Some of these ideas come through the Advisory Council, whose members are on other community groups or co-ops and bring them forward at the meetings. In some cases AES faculty have to mention that we are here for research and we direct people with questions or concerns about outreach activities to the appropriate Cooperative Extension Service staff.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Other (Informal contacts with producers)

Brief Explanation

Stakeholder input is collected by the pertinent program, depending on the source and area of interest. In many cases stakeholders come to AES faculty and staff with questions or concerns and we can provide an answer in short order. In other cases we are able to get them the information after doing a bit of searching. We are also able to direct them to outside resources such as the VI dept of Agriculture or other federal agencies or NGOs that may have the information they are seeking.

3. A statement of how the input was considered

- To Identify Emerging Issues
- Redirect Research Programs

Brief Explanation

Input is used when developing future research projects. In some cases an idea is not really researchable but we make an effort to provide some feedback to the stakeholder on these topics. In other cases where there is a researchable idea brought to us we can incorporate it into current projects or into new projects. Sometimes the lag time between getting an idea and being able to implement the research project to come up with an answer is frustrating to the stakeholders, but when the information is finally generated they are glad to have it.

Brief Explanation of what you learned from your Stakeholders

We learned that there is still a good bit of confusion about the roles of AES and CES in the eyes of the stakeholders, both internal and external. The local community as well as the central administration of the University are still not clear on the function of AES and CES as part of the land grant system. In many cases stakeholders approach AES about outreach activities and we have to direct them to the CES offices. In addition, there is some pressure from the central administration for AES faculty and staff to conduct outreach activities in spite of there being no joint appointments between AES and CES that would allow us to do these activities.

We also learned that our stakeholders have very specific ideas of what they would like to see AES doing. They provide valuable input on crop varieties that they would like to see evaluated for local production as well as issues relating to minimizing water usage for crop production.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	1432473	0

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	763888	0
Actual Matching	0	0	288831	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	1052719	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years				
Carryover	0	0	0	0

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Animal Science - Small Ruminants
2	Animal Science - Dairy Cattle
3	Animal Science - Beef Cattle
4	Plant Biotechnology
5	Plant Germplasm Conservation and Enhancement
6	Agronomy - Tropical hay production
7	Horticulture
8	Irrigation
9	Aquaculture - Biofloc systems
10	Aquaculture
11	Whole Farm Systems Research

Program #1**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Animal Science - Small Ruminants

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals			40%	
303	Genetic Improvement of Animals			20%	
305	Animal Physiological Processes			40%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	3.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	68476	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	28551	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Conduct research project

- Sell breeding stock to local farmers
- Present data at conferences
- Publish results in scientific journals

2. Brief description of the target audience

The target audience of this research is sheep producers in the US Virgin Islands and the greater Caribbean area, as well as producers in all tropical areas of the world.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted****Year Target****Plan:** 0

2007 : 0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Abstracts presented at conferences

Year	Target	Actual
2007	1	2

Output #2**Output Measure**

- Journal articles

Year	Target	Actual
2007	1	0

Output #3**Output Measure**

- Livestock Production Workshop with VI Dept of Agriculture

Year	Target	Actual
2007	{No Data Entered}	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	Outcome Name
1	Number of local farmers using crossbred sheep

Outcome #1**1. Outcome Measures**

Number of local farmers using crossbred sheep

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	10	15

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Local sheep producers want to increase the size and efficiency of lambs produced.

What has been done

The DRPX ewes (n = 26) were compared to an established St. Croix White flock (STX; n = 40) over a period of 2 yr (4 lamb crops; 163 births). The DRPX ewes were introduced into the flock for their first lambing in March 2004.

Subsequent lamb crops were produced in November 2004, July 2005 and March 2006.

Results

The STX ewes were older than DRPX ewes at the first lambing (4.2 vs. 1.0 yr, respectively). Overall there was no difference in the proportion of DRPX and STX ewes that were exposed to rams that lambled (88.7 vs. 80.4 percent respectively). There was no difference between STX and DRPX ewes in weight at breeding (42.4 vs. 43.6 kg, respectively) or weaning (42.5 vs. 45.4 kg, respectively). Number of lambs born per ewe lambing was greater in STX than in DRPX ewes (1.9 vs. 1.5 lambs, respectively). Number of lambs born increased in DRPX ewes from 1.2 to 1.8 between the first and third lamb crops but there was no change in the STX ewes during this time (2.1 vs. 1.9 lambs, respectively). Number of lambs weaned increased in DRPX ewes from 1.2 to 1.8 between the first and third lamb crops but there was no change in the STX ewes during this time (1.8 vs. 1.4 lambs, respectively). Weaning percent was higher in DRPX than STX ewes (95.2 vs. 83.6 percent respectively). Litter weaning weight was higher in DRPX than in STX ewes (22.7 vs. 19.7 kg, respectively). Even though the DRPX ewes had fewer lambs born than STX ewes they produced heavier litter weaning weights. These results indicate that DRPX ewes can be used in an accelerated lambing system under tropical conditions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
301	Reproductive Performance of Animals
305	Animal Physiological Processes

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (Staff vacancies)

Brief Explanation

Staffing shortages were problematic during the past year but did not impact the data collection to a great extent.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- Other (Informal discussions)

Evaluation Results

Key Items of Evaluation

Program #2**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Animal Science - Dairy Cattle

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
305	Animal Physiological Processes			20%	
306	Environmental Stress in Animals			80%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual	0.0	0.0	1.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	24020	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	10011	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Due to staffing vacancies and the end of the dairy industry on St. Croix there was no progress made under either objective during this year. There are no more dairies in the USVI but the collaborative projects dealing with evaluating coat color of cows at other stations will be continued. Images for coat color analysis were received from PR and MS but they were not processed because of a lack of a technician. The technical support issue is being addressed and replacements are being hired.

2. Brief description of the target audience

Target audiences would include dairy cattle producers in the tropics and southern US.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted**

Year Target

Plan: 0

2007 : 0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Abstracts presented

Year	Target	Actual
2007	0	0

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	Outcome Name
1	Number of collaboratrs on the project using coat color in their study design

Outcome #1**1. Outcome Measures**

Number of collaborators on the project using coat color in their study design

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	2

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Coat color has been shown to impact dairy cow reproduction and milk production. Selecting animals for less black hair coat may alleviate heat stress in hot and humid climates.

What has been done

Images have been collected of cows on several collaborators research projects and will be analyzed for percent black coat color to determine if there is an effect on physiological measures of heat stress.

Results

Images have not been analyzed due to staff shortages.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
306	Environmental Stress in Animals

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (Staffing shortages)

Brief Explanation

Staff shortage within the program has led to a backlog of data analysis. It is hoped that within the next year the staffing issue will be addressed and progress will be made on data analysis.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- Other ()

Evaluation Results**Key Items of Evaluation**

Program #3**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Animal Science - Beef Cattle

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
305	Animal Physiological Processes			30%	
306	Environmental Stress in Animals			70%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.5	0.0
Actual	0.0	0.0	0.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	4165	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1736	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

The objective of this study was to evaluate the relationship between temperament and growth in Senepol calves from weaning to yearlings. Bull (n = 22) and heifer (n= 31) calves were evaluated at weaning (211 d of age), 90 d post-weaning (302 of age) and as yearlings (374 d of age) using chute score (CS) and exit velocity (EV) as indicators of temperament. Calves were weighed at each evaluation and scrotal circumference (SC) was measured for bulls as yearlings. The CS was determined on a 1 to 5 scale with 1 being calm and 5 being extremely agitated and EV, reported in m/sec, was measured as the animals exited the chute using an electric timing system.

2. Brief description of the target audience

Target audiences would include beef cattle producers in the tropics and southern US. Because some of the results were presented at an international conference in Panama, the target audience is expanded to include cattle producers from Central and South America.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted**

Year Target
Plan: 0
 2007 : 0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Abstracts

Year	Target	Actual
2007	1	1

Output #2**Output Measure**

- Journal articles

Year	Target	Actual
2007	0	0

Output #3**Output Measure**

- International Presentations

Year	Target	Actual
2007	{No Data Entered}	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	Outcome Name
1	# of farmers using temperament to select cattle

Outcome #1**1. Outcome Measures**

of farmers using temperament to select cattle

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Calmer cattle have higher rates of gain and yield higher quality meat. Selecting cattle for calm disposition can lead to higher productivity and a better quality product for the consumer.

What has been done

Senepol cattle have been evaluated for temperament at weaning and as yearlings in order to determine the relationship between temperament and growth.

Results

None of the calves received a CS greater than 4 at any time. At weaning there was no difference ($P > 0.10$) in CS between bulls and heifers (1.6 vs. 1.9, respectively). At 90 d and as yearlings heifers had higher CS than bulls (2.4 and 2.5 vs. 1.7 and 1.7, respectively). The CS increased over time in heifers but not in bulls. Heifers had greater EV than bulls at weaning, 90 d and as yearlings (3.2, 3.2 and 2.9 vs. 2.7, 2.6 and 2.4 m per sec, respectively). The EV did not change over time in either bulls or heifers. In bulls with a CS of 3 ADG from weaning to 90 d was greater than ADG from weaning to yearling. There was no difference in ADG from weaning to 90 d and weaning to yearling in bulls with a CS of 1 or 2. In heifers there was no difference in ADG during any time period among any of the CS groups. Overall CS and EV had a moderate correlation (0.424). The CS and EV had a moderate correlation at weaning (0.518), 90 d (0.383) and at yearling (0.446). Weight and EV were correlated at 90 d (-0.434) but not at any other time and CS was not correlated with weight at any time. These results show that the temperament of Senepol calves does not change over time after weaning and heifers are more temperamental than bulls.

4. Associated Knowledge Areas

KA Code	Knowledge Area
306	Environmental Stress in Animals
305	Animal Physiological Processes

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (Staff shortages)

Brief Explanation

Staff vacancies in the program had a small impact on realizing outcomes. There just wasn't enough time to get everything done between field work and office work this year. It is hoped that these staff positions will be filled within the upcoming year.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- Other ()

Evaluation Results

Key Items of Evaluation

Program #4**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Plant Biotechnology

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms			20%	
204	Plant Product Quality and Utility (Preharvest)			40%	
206	Basic Plant Biology			40%	
Total				100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual	0.0	0.0	1.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	14198	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	5920	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- Conduct research
- Work with students in lab
- Analyse data and presnet at conferences

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less then two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted**

Year	Target
------	--------

Plan:	0
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2007 :	0
--------	---

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Journal article

Year	Target	Actual
2007	{No Data Entered}	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	Outcome Name
1	Number of local farmers growing micropropagated pineapple

Outcome #1**1. Outcome Measures**

Number of local farmers growing micropropagated pineapple

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The Virgin Islands farmers and backyard growers because they have limited financial and land resource

What has been done

As the land values increase on the island, more efficient utilization of the land is needed to increase efficiency. Double-row spacing regimes were established for three spacing, 1m x 1m; 1m x 2m or 1m x 3m.

Cassava tissue culture research involved the study of induction of friable embryogenic callus from commercially important cassava varieties. Friable embryogenic callus is needed as cell lines for plant genetic engineering. Most cassava research has focused on a few cassava lines that perform well in vitro. However, the commercially important varieties have had limited success for cellular gene manipulation.

Results

The double-row system for papaya reduces the irrigation need by one line. This concentrates the roots to more efficiently make use of the drip irrigation water. A critical factor in planting papayas closer together is the tendency to have elongated stem growths which is more susceptible to wind damage as well as fruit set higher on the stem. A plant spacing of 1m x 2m proved to be the most efficient.

Six cassava varieties were evaluated and friable embryogenic callus used in genetic engineering was successfully induced in three varieties.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (Federal certification of transgenic crops.)

Brief Explanation

The lead scientist was on sabbatical leave for six months

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- Retrospective (post program)
- Other (Informal discussions)

Evaluation Results

Key Items of Evaluation

Program #5**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Plant Germplasm Conservation and Enhancement

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
202	Plant Genetic Resources			80%	
205	Plant Management Systems			20%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual	0.0	0.0	1.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	83887	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	34964	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

• Conduct research project • Sell papaya seeds to local framers • Present data at conferences • Develop fact sheets for local growers • Publish results in scientific journals

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less then two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted****Year Target****Plan:**

2007 : 0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Abstracts presented at conference

Year	Target	Actual
2007	{No Data Entered}	1

Output #2**Output Measure**

- Workshops or Seminars

Year	Target	Actual
2007	{No Data Entered}	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	Outcome Name
1	Number of local farmers growing selected plant varieties

Outcome #1**1. Outcome Measures**

Number of local farmers growing selected plant varieties

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The Virgin Islands farmers and backyard growers because they have limited financial and land resource.

What has been done

Sorrel, *Hibiscus sabdariffa*, is a plant originally native to Africa which has been grown in the Caribbean for centuries that is used fresh, during the winter months, or drier to make. Germplasm of 60 accessions were obtained from the USDA-ARS-Seedlings of sorrel were planted in calcareous soils with a pH range of 8.0-8.9 and compared with seven local cultivars.

Bt sweet corn was grown in an initial trial to determine its potential use in the Virgin Islands where worm damage is a continuous challenge. The Bt sweet corn was compared to tight husk lines from Puerto Rico and Hawaii as well as local strains used for roasting.

Results

All sorrel developed interveinal chlorosis. Many of the accessions also developed terminal necrosis. Five accessions, from the USDA germplasm collection, were found that have potential for production in the Virgin Islands. Sorrel is a seasonal crop with flower and fruit production during the winter months. On-farm evaluation is being planned for the next cropping cycle to take advantage of lower pH soils.

The Bt sweet corn had significantly more full ears without worm damage. The tropical sweet corn lines and local strains failed to produce grade A sweet corn. The Bt sweet corn was found to be two weeks earlier than maturity date listed for the variety. This was also two weeks earlier than the other corn grown. The earliness may be due to the short day length since the corn was planted in October. Future trials will be conducted throughout the year to determine the year round effect of day length on the Bt sweet corn production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
202	Plant Genetic Resources

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (leave)

Brief Explanation

The lead scientist was on sabbatical leave for six months

V(l). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #6**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Agronomy - Tropical hay production

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
204	Plant Product Quality and Utility (Preharvest)			60%	
205	Plant Management Systems			40%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	4.0	0.0
Actual	0.0	0.0	3.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	95001	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	39610	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- ull; Conduct research project
- ull; Sell hay to local framers
- ull; Present data at conferences
- ull; Publish results in scientific journals
- ull; Conduct local and regional seminars

2. Brief description of the target audience

The target audience of this research is livestock and equine producers in the US Virgin Islands and the greater Caribbean area, as well as producers in all tropical areas of the world.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted**

Year Target
 Plan: 0
 2007 : 0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Abstracts presented at conferences

Year	Target	Actual
2007	1	0

Output #2**Output Measure**

- Journal articles

Year	Target	Actual
2007	1	0

Output #3**Output Measure**

- Hay Production Workshop with VI Dept of Agriculture, Cooperative Extension Service, and local farmers

Year	Target	Actual
2007	{No Data Entered}	1

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	Outcome Name
1	Number of local farmers utilizing legume hay and adoption of legume hay production techniques by local area farmers and the USVI Department of Agriculture.

Outcome #1**1. Outcome Measures**

Number of local farmers utilizing legume hay and adoption of legume hay production techniques by local area farmers and the USVI Department of Agriculture.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	10	15

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Local livestock and equine producers want to be able to feed high quality locally produced legume hay..

What has been done

Tropical legume varieties were tested for use as commercial hay. Clitoria ternatea, Lablab purpureus, Vigna unguiculata, Glycine max, Crotalaria juncea, and Mucuna deeringiana were planted to determine plant vigor, biomass, regrowth vitality, weed competitiveness, and plant tissue analysis was completed to determine forage quality.

Results

All legumes exhibited >85% germination rates with the exception of Mucuna which exhibited a <5% germination rate. Following grazing by St. Croix White Hair x Dorper sheep Lablab expressed the greatest level of regrowth vitality followed by Clitoria, Vigna, Glycine, and Crotalaria. All other data relating to biomass production, weed competitiveness, and regrowth vitality, and plant vigor is currently being analyzed. Plant tissue samples are being analyzed by A&L Laboratories to determine plant quality and nutritive components.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
204	Plant Product Quality and Utility (Preharvest)

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (Staff vacancies)

Brief Explanation

Staffing shortages were problematic and major equipment needed for project operation was not available due to shipping problems which consumed a lot of time and effort to get resolved.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- Retrospective (post program)

Evaluation Results**Key Items of Evaluation**

Program #7**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Horticulture

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			30%	
133	Pollution Prevention and Mitigation			10%	
202	Plant Genetic Resources			20%	
205	Plant Management Systems			30%	
216	Integrated Pest Management Systems			10%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	0.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	119146	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	49677	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- Conduct research
- Present data at conferences
- Publish results in scientific journals

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less than two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Research citations

Year	Target	Actual
2007	1	0

Output #2

Output Measure

- Abstracts presented at conferences

Year	Target	Actual
2007	1	0

Output #3

Output Measure

- Workshops or seminars

Year	Target	Actual
2007	{No Data Entered}	2

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	Outcome Name
1	Selection of pest and disease resistant cultivars and effect of cover crops on soil characteristics
2	# of farmers using selected cultivars
3	# farmers adopting sustainable production systems

Outcome #1**1. Outcome Measures**

Selection of pest and disease resistant cultivars and effect of cover crops on soil characteristics

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The Virgin Islands farmers and backyard growers because they have limited financial and land resource.

What has been done

Two studies to evaluate the effect of protected agriculture on virus incidence and production of Caribbean peppers were conducted in the U.S. Virgin Islands. In the first experiment, spun-bonded rowcover was used as insect barrier in the initial growing stage (2 month) of Puerto Rican sweet pepper. Peppers were not sprayed to allow for insect infestation. At rowcover removal, protected plants were taller than uncovered plants and symptoms of virus infection were observed in the uncover plots, but not in the covered plots. Plants with symptoms were positive to potyviruses as detected by ELISA (Agdia). Samples from the covered plots were negative. Virus incidence increased in time and after 6 months all tested plants from both treatments were positive to potyviruses. Weekly harvest started 4.5 months after planting and continued for 9 weeks.

Results

Yield in the first 4 harvests was higher in the covered plots. Similarly, fruits were larger in the covered plots for the first two harvests only. Fruit size decreased gradually through the harvest period reflecting the high incidence of virus infections. In the second experiment, potted habanero and Puerto Rican sweet pepper were grown protected from insects in a screen-house enclosed with a net mesh 81. Control plants were grown outside the screen-house. Tobacco etch virus and pepper mottle virus were detected after 4 months in some unprotected plants with symptoms, but not in protected plants. Yield of protected habanero peppers was 1.9 times the unprotected yield. Puerto Rican sweet pepper, however did not set fruit either in the screen-house or outside suggesting that the potting system may not be adequate for this variety in the U.S. Virgin Islands.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
133	Pollution Prevention and Mitigation
216	Integrated Pest Management Systems
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems

Outcome #2**1. Outcome Measures**

of farmers using selected cultivars

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources

Outcome #3**1. Outcome Measures**

farmers adopting sustainable production systems

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
102	Soil, Plant, Water, Nutrient Relationships
216	Integrated Pest Management Systems
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (staff shortage)

Brief Explanation

The lead scientist vacated the position seven months into the year.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- During (during program)

Evaluation Results

Key Items of Evaluation

Program #8**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Irrigation

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			30%	
111	Conservation and Efficient Use of Water			30%	
132	Weather and Climate			10%	
205	Plant Management Systems			10%	
405	Drainage and Irrigation Systems and Facilities			20%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	0.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	6380	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	2639	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- Conduct research projects
- Present data at conferences
- Publish results in scientific journals

2. Brief description of the target audience

The target audiences are the local crop farmers and back yard growers. These producers normally have less than two acres under production. The Virgin Islands has only three producers with total production acreage over two acres.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Abstract presented at conference

Year	Target	Actual
2007	1	0

Output #2

Output Measure

- Research citations

Year	Target	Actual
2007	1	0

Output #3

Output Measure

- Workshops and seminars

Year	Target	Actual
2007	{No Data Entered}	1

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	Outcome Name
1	Knowledge of evapo-transpiration crop coefficients and water use efficiency in crop production
2	Knowledge of water requirements in shade crops production
3	# of farmers growing shade crops
4	# farmers adopting irrigation strategies based on soil moisture

Outcome #1**1. Outcome Measures**

Knowledge of evapo-transpiration crop coefficients and water use efficiency in crop production

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The Virgin Islands farmers and backyard growers because they have limited financial and land resource.

What has been done

Drip irrigation is the most efficient system for water usage in vegetable crop production in the semi arid Virgin Islands. A tomato variety trial involving nine tomato cultivars was established under a drip irrigation system. For added water conservation, half of the replicated plots were mulched with grass hay.

Results

The mulch had the added advantage of control of weeds in the plots. Incidents of disease and insect infestations were monitored and found to be lower in the mulched plots during initial growth and fruit set. The normal tomato growing season occurs during the winter months and production data wasn't available by the end of 2007.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
205	Plant Management Systems
132	Weather and Climate
405	Drainage and Irrigation Systems and Facilities
102	Soil, Plant, Water, Nutrient Relationships

Outcome #2**1. Outcome Measures**

Knowledge of water requirements in shade crops production

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)**What has been done****Results****4. Associated Knowledge Areas**

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
205	Plant Management Systems
405	Drainage and Irrigation Systems and Facilities
102	Soil, Plant, Water, Nutrient Relationships

Outcome #3**1. Outcome Measures**

of farmers growing shade crops

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)****What has been done****Results****4. Associated Knowledge Areas**

KA Code	Knowledge Area
205	Plant Management Systems
111	Conservation and Efficient Use of Water
405	Drainage and Irrigation Systems and Facilities
102	Soil, Plant, Water, Nutrient Relationships

Outcome #4**1. Outcome Measures**

farmers adopting irrigation strategies based on soil moisture

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
405	Drainage and Irrigation Systems and Facilities
111	Conservation and Efficient Use of Water
205	Plant Management Systems
102	Soil, Plant, Water, Nutrient Relationships

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (staff shortage)

Brief Explanation

The lead scientist vacated the position seven months into the year.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- Retrospective (post program)
- During (during program)

Evaluation Results**Key Items of Evaluation**

Program #9**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Aquaculture - Biofloc systems

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
307	Animal Management Systems			80%	
403	Waste Disposal, Recycling, and Reuse			20%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual	0.0	0.0	1.5	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	116764	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	34358	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- Conduct research project
- Conduct training
- Present data at conferences
- Publish results in scientific journals

2. Brief description of the target audience

The target audience is researchers, farmers, entrepreneurs, teachers, development workers and hobbyists. These are the categories of people who have accessed our results. The audience is local, national and international.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted**

Year Target
Plan: 0
 2007 : 0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Abstracts presented at conferences

Year	Target	Actual
2007	1	2

Output #2**Output Measure**

- Journal articles

Year	Target	Actual
2007	1	0

Output #3**Output Measure**

- Short Courses

Year	Target	Actual
2007	{No Data Entered}	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	Outcome Name
1	Number of new farmers anywhere adopting aquaponic technology

Outcome #1**1. Outcome Measures**

Number of new farmers anywhere adopting aquaponic technology

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Farmers in the Virgin Islands are very interested in shrimp culture. A biofloc system has been developed for the production of tilapia in large (1/20 acre) tanks. If a polyculture system involving tilapia and shrimp could be developed and demonstrated to increase profitability, farmers would be interested in adopting this technology.

What has been done

An experiment was conducted to determine the effects of polyculture of monosex male Nile tilapia (*Oreochromis niloticus*) and two densities of Pacific white shrimp (*Litopenaeus vannamei*) on growth, total production, and water quality in a low-salinity, biofloc system. The experiment was conducted in six, 30-m³ tanks and consisted of two treatments with three replicates each. Treatments were: low-density polyculture (LDP) and high-density polyculture (HDP). A commercially available sea salt (Crystal Sea(r) Marinemix) was added to each tank to achieve a salinity of 5 parts per thousand. All tanks contained four, 1-m³ cages. One-hundred male tilapia (average weight = 116 g) were stocked into each cage. Additionally, the LDP and HDP treatments were stocked with shrimp (PL20) at a rate of 100 shrimp/m³ and 200 shrimp/m³, respectively. Fish were fed ad libitum a 32% protein floating diet twice daily for twenty minutes and shrimp were fed three times daily based on a feed chart using a 30% protein shrimp diet. Water quality parameters were measured biweekly. Shrimp were sampled biweekly to determine growth rates.

Results

There was no significant difference in water quality between the two treatments for parameters measured. There was a significantly higher average weight of tilapia in HDP (586 g) compared to LDP (550 g). There was no significant difference in tilapia FCR (1.5) or survival (99%) between treatments. Tilapia production was significantly higher in the HDP (7.7 kg/m³) compared to the LDP (7.3 kg/m³). There was no significant difference in shrimp average weight (14.3 and 12.5 g) with the LDP and HDP, respectively. There was no significant difference in survival (6%), shrimp production (0.1 kg/m³), or FCR (15.0) between treatments. Total tank production was significantly higher in HDP (7.9 kg/m³) compared to LDP (7.6 kg/m³). There was no significant difference in overall FCR (1.6) between the two treatments.

Results showed the temperature, dissolved oxygen, pH, salinity, alkalinity, and hardness were optimal for shrimp and tilapia growth. However, nitrogenous waste levels were persistently high throughout the experiment for low-salinity shrimp culture, and the total suspended solids levels were low for a biofloc system. Confined tilapia are unable to effectively resuspend solids in the production system. Total suspended solids, an important component to the success of a biofloc system, create a three-dimensional area for nitrifying bacteria to colonize and metabolize wastes. As a result of low total suspended solids concentrations, nitrogenous waste levels were sub-optimal for shrimp survival throughout the experiment. It appeared that tilapia preyed on juvenile shrimp upon stocking. The Three fourth inch cage mesh size allowed tilapia to consume juvenile shrimp that passed through the mesh. Shrimp bioassays were performed in all tanks for the experiment's duration. Shrimp survival averaged 60% in the bioassays, further demonstrating that predation occurred and resulted in far more shrimp mortality than sub-optimal water quality parameters.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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403	Waste Disposal, Recycling, and Reuse
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (None)

Brief Explanation

There were no external factors that had an impact on this project.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #10**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Aquaculture

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
205	Plant Management Systems			40%	
307	Animal Management Systems			30%	
403	Waste Disposal, Recycling, and Reuse			30%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual	0.0	0.0	2.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	116764	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	34358	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- Conduct research project
- Provide training
- Present data at conferences
- Publish results in scientific journals

2. Brief description of the target audience

The target audience is researchers, farmers, entrepreneurs, teachers, development workers and hobbyists. These are the categories of people who have accessed our results. The audience is local, national and international.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted****Year Target****Plan:** 0

2007 : 0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target**

Output #1**Output Measure**

- Abstracts presented at conferences

Year	Target	Actual
2007	1	3

Output #2**Output Measure**

- Journal articles

Year	Target	Actual
2007	1	0

Output #3**Output Measure**

- Book Chapters

Year	Target	Actual
2007	{No Data Entered}	1

Output #4**Output Measure**

- Conference Proceedings

Year	Target	Actual
2007	{No Data Entered}	2

Output #5**Output Measure**

- Workshops

Year	Target	Actual
2007	{No Data Entered}	2

Output #6**Output Measure**

- Short Courses

Year	Target	Actual
2007	{No Data Entered}	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	Outcome Name
1	Number of new farmers anywhere adopting aquaponic technology

Outcome #1**1. Outcome Measures**

Number of new farmers anywhere adopting aquaponic technology

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	5

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Farmers who establish aquaponic systems want to know the best varieties and production levels of various crops.

What has been done

Four varieties of cantaloupe were grown in a commercial-scale aquaponic system in three staggered crop cycles. The initial seeding in the greenhouse was August 21 with subsequent seeding at two week intervals. Seedlings were transplanted from the greenhouse into the system after two weeks. Plant density on the aquaponic rafts was 0.67/m². The hydroponic growing area (214 m²) was organized into blocks (8.9 m²), and each block was randomly assigned a variety and transplant date. Biological pest controls were used to prevent infestation with caterpillars and aphids. Harvests began 70 days after transplanting and continued for 50 days to December 19.

Results

Total production (kg/m²) for the three harvests was 31.0 for Jaipur 18.6 for Primo, 13.8 for Ambrosia and 0.2 for Honey Bun. Total number of fruits (#/m²) for the three harvests was 11.2 for Jaipur, 9.2 for Primo, 7.8 for Ambrosia and 0.2 for Honey Bun. Production declined considerably between the first and the second two plantings for three most productive varieties, possibly resulting from a decrease day length and/or nutrient concentrations. The variety Honey Bun succumbed to fungus caused by heavy rains. Jaipur produced the highest number of fruits and the largest fruits. However, Jaipur's large fruit size made it less marketable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Other (None)

Brief Explanation

There were no external factors that impacted this project.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #11**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Whole Farm Systems Research

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
205	Plant Management Systems			40%	
307	Animal Management Systems			10%	
403	Waste Disposal, Recycling, and Reuse			20%	
601	Economics of Agricultural Production and Farm Management			30%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual	0.0	0.0	2.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	115087	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	47007	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- Conduct research project
- Present data at conferences
- Publish results in scientific journals, farmers bulletins and fact sheets

2. Brief description of the target audience

The target audience is researchers, farmers, extension agents, Agriculture Department officials and NGOs. The audience is local.

V(E). Planned Program (Outputs)**1. Standard output measures****Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)**Patent Applications Submitted**

Year	Target
Plan:	0
2007 :	0

Patents listed**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	0	0	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- Abstracts presented at conferences

Year	Target	Actual
2007	1	0

Output #2**Output Measure**

- Journal articles, farmers bulletins, fact sheets

Year	Target	Actual
2007	1	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	Outcome Name
1	Number of local farmers who adopt some portion of model farm

Outcome #1**1. Outcome Measures**

Number of local farmers who adopt some portion of model farm

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Agricultural production in the Virgin Islands is generally practiced as a part-time activity on small parcels of land. Under these circumstances youth in the V.I. generally do not see agriculture as a viable career. Therefore, a larger farm was established for whole farm systems research and as a model to determine if it could be operated profitably while providing full time employment to several farm workers. To increase chances for profitability the farm employed water harvesting and storage and the integration of fish and vegetable production. If this model was successful and widely adopted, it would be a vehicle to increase agricultural production in the Virgin Islands, create employment and stimulate the economy.

What has been done

A 5-acre farm was established. It consisted of a 1-acre rainwater catchment, a 500-m³ rainwater storage pond, seven 80-m³ fish culture tanks, a 150-m³ sludge pond, a 24-m³ clear water holding pond, a refrigerated feed storage container, an implement storage container, a small greenhouse for seedlings, a packing shed, an irrigation system and 3 acres of land for vegetable production. The farm was operated as a commercial farm while whole farm systems data was collected.

Tilapia were cultured in the fish tanks using a biofloc technology. Production was staggered to produce a continuous supply of fish. The bottom of the fish tank sloped at 3% slope to the middle of the tank, which contained a 45 degree cone. A valve on the drain line was opened daily to discharge sludge from the bottom of the cone into the sludge storage pond. The concentration of solids in the sludge was too high for drip irrigation. Initially a clarifier was installed to remove the solids and produce a clear supernatant for irrigation. Later a geotube was installed, and polymer was used to coagulate solids prior to filtration through the geotextile membrane of the geotube.

The initial strategy was to grow three to four vegetable crops on a large scale and sell them at a wholesale level to supermarkets and other large buyers. The strategy eventually shifted to producing a large number of crops on a smaller scale and selling them at retail value. A farm store was constructed at the university to sell the model farm produce as well as produce from other research projects. The farm store contained a fish holding tank and a fish processing room.

Results

The rainwater catchment and rainwater storage pond worked well to provide a reliable water supply for the farm. Supplemental water was only required in two of the last 16 months of this project. Availability of water is one of the major limitations to vegetable production in the V.I., and therefore rainwater harvesting and storage demonstrated a viable solution to the water supply problem.

The use of fish culture effluent for the fertilization and irrigation of field crops was not accomplished. The use of clarification to produce a clear supernatant with low total dissolved solids (TSS) did not work. When geotube technology became available, it produced a clear filtrate that was very low in TSS and suitable for drip irrigation. In addition, the solids that remained were dry enough (13% dry weight) to be shoveled and incorporated into soil as an organic fertilizer. However, by the time this technique was tested, the farm manager resigned in August, 2007, effectively ending the project.

The approach to raise three to four crops for the wholesale market not effective. The prices received were low, and the time involved in making deliveries was excessive. In addition, there was no ready market for unprocessed fish. In response to these obstacles the university provided funds to construct a farm store, which included a fish holding tank and a fish processing room. Produce was sold at retail values and tilapia were sold live, cleaned or as fillets. The vegetable production strategy shifted to the continuous production of many crops to provide variety and consistency of farm store products. In the first 7 months of 2007 the following quantities of 20 crops were produced:

Crop	Amount (lbs)	Crop	Amount (lbs)
Tilapia	6,428	Sweet Potato	218
Tomato	1,664	Sugarcane	119
Eggplant	1,471	Bell Pepper	95
Banana	1,226	Mint	36
Cucumber	1,059	Dill	17
Sweet Corn	435	Hot Pepper	15
Cassava	427	Lemon Balm	13
Okra	346	Oregano	9
Chives	338	Basil	3
Collard Greens	299	Seasoning Pepper	2

Total fish and vegetable production were for 6,428 and 7,792 lbs, respectively, for 7 months. Annual production would be equivalent to 11,019 and 13,358 lbs, respectively. The nature of this project required a long experiential period to develop optimum crop rotations, nutrient and organic matter management and integrated pest management. The best varieties, cover crops, mulches and planting schedules were not determined. Tilapia stocking and harvesting schedules, feeding rates and water quality control were not perfected. With more time, production of fish and vegetables would have increased severalfold. When a decision was made to terminate this project due to funding constraints and the project manager vacancy, production and income were well below a level needed to demonstrate economic viability.

A major constraint to economic feasibility was labor within the context of a university system where the work day was only 7 hours and the salaries were too high to expand the work force of four (one manager and three laborers) assigned to this project. Salaries would have been adjusted to reflect actual farm wages in the economic analysis. However, the hours worked by four university employees (28 hours per day) were not even equivalent to that of three farm workers in the private sector, and a considerable amount of time was devoted to collecting research data that would not be required in a commercial operation. The project needed more labor to increase production levels and income to their potential.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other (Staffing issues)

Brief Explanation

From the outset, this project was hampered by the difficulty in recruiting a project manager interested in whole farm systems research. In particular it was difficult to find someone willing to work with both fish and plants. During the life of this project, two project managers were hired. It took more than a year to recruit each one, and both of them preferred horticulture to aquaculture and both resigned before efficient management systems were developed and production was maximized. Both managers, who had M.S. degrees in horticulture, were overwhelmed and frustrated by the diverse demands of an actual farming operation coupled with a research project that was hindered by a shortage of manpower.

V(l). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)

Evaluation Results

Key Items of Evaluation